



## ABSTRACT

Waveguide grating devices. One includes at least one waveguide having an end, the end having an endface; and a waveguide grating fabricated on the endface, the waveguide grating having at least one waveguide layer and at least one grating layer.

5 The waveguide layer is a separate waveguide from the waveguide on which the waveguide grating is fabricated. Systems for spectral filtering. One, which utilizes a guided-mode resonance effect in a waveguide, includes at least one waveguide having a proximal end and a distal end having an endface; and a waveguide grating fabricated on the end of the waveguide and having a plurality of variable parameters such as

10 permittivity of the grating layer(s) and permittivity of the waveguide layer(s). Methods of forming waveguide grating devices, and methods of detecting one or more parameters of a medium using a waveguide grating device are also disclosed. A waveguide grating device that utilizes the guided mode resonance effect in a waveguide having an endface on which a waveguide grating is fabricated. The waveguide grating has a waveguide

15 layer, which is waveguide separate from the waveguide on which the waveguide grating is fabricated, and a grating layer. Also disclosed is a system for spectral filtering. The system utilizes a guided mode resonance effect in a waveguide, and includes a waveguide grating device. The waveguide grating fabricated on the end of the waveguide grating device has a plurality of variable parameters such as permittivity of

20 the grating layer(s) and permittivity of the waveguide layer(s). For the disclosed waveguide gratings, the waveguide layer and the grating layer may be the same layer. The system also includes a source coupled to the proximal end of the waveguide for propagating a signal therethrough. Methods for forming the disclosed waveguide grating devices are included. Such methods include providing waveguides having ends with

25 endfaces, and fabricating waveguide gratings on the endfaces to form the waveguide grating devices. Methods of detecting one or more parameters of a medium are also disclosed. The methods include providing a waveguide grating device, contacting the waveguide grating with a medium, propagating a signal having at least one signal attribute through the waveguide, and comparing the modified signal attribute to a known

30 signal attribute to detect a parameter of the medium.